

OCT 20 2006

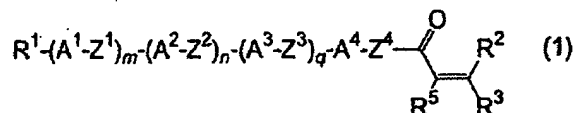
Application No.: 10/664,671

Docket No.: JCLA12230-R

AMENDMENTSIn the Claims:

Please amend the claims as follows:

1. (currently amended) A compound of formula (1):



wherein  $R^1$  represents hydrogen, halogen,  $-\text{CN}$ ,  $-\text{CF}_3$ ,  $-\text{CF}_2\text{H}$ ,  $-\text{CFH}_2$ ,  $-\text{OCF}_3$ ,  $-\text{OCF}_2\text{H}$ ,  $-\text{N}=\text{C}=\text{O}$ ,  $-\text{N}=\text{C}=\text{S}$ , or alkyl having from 1 to 20 carbon atoms, and any  $-\text{CH}_2-$  of the alkyl may be substituted with  $-\text{O}-$ ,  $-\text{S}-$ ,  $-\text{CO}-$ ,  $-\text{COO}-$ ,  $-\text{OCO}-$ ,  $-\text{CH}=\text{CH}-$ ,  $-\text{CF}=\text{CF}-$  or  $-\text{C}\equiv\text{C}-$ , and any hydrogen thereof may be substituted with halogen or  $-\text{CN}$ ;  $R^2$ ,  $R^3$  and  $R^5$  each independently represent hydrogen or alkyl having from 1 to 3 carbon atoms;  $A^1$ ,  $A^2$ ,  $A^3$  and  $A^4$  each independently represent 1,4-cyclohexylene, 1,4-cyclohexenylene, 1,4-phenylene, naphthalene-2,6-diyl, tetrahydronaphthalene-2,6-diyl, fluorene-2,7-diyl, bicyclo[2.2.2]octane-1,4-diyl or bicyclo[3.1.0]hexane-3,6-diyl, and in these rings, any  $-\text{CH}_2-$  may be substituted with  $-\text{O}-$ , and any  $-\text{CH}=\text{CH}-$  may be substituted with  $-\text{N}=\text{N}-$ , and in these rings, any hydrogen may be substituted with halogen or alkyl having from 1 to 5 carbon atoms;  $Z^1$ ,  $Z^2$  and  $Z^3$  each independently represent a single bond,  $-(\text{CH}_2)_a-$ ,  $-\text{O}(\text{CH}_2)_a-$ ,  $-(\text{CH}_2)_a\text{O}-$ ,  $-\text{O}(\text{CH}_2)_a\text{O}-$ ,  $-\text{CH}=\text{CH}-$ ,  $-\text{C}\equiv\text{C}-$ ,  $-\text{COO}-$ ,  $-\text{OCO}-$ ,  $-(\text{CF}_2)_2-$ ,  $-\text{C}\equiv\text{C}-\text{COO}-$ ,  $-\text{OCO}-\text{C}\equiv\text{C}-$ ,  $-\text{CH}=\text{CH}-(\text{CH}_2)_2-$ ,  $-(\text{CH}_2)_2-\text{CH}=\text{CH}-$ ,  $-\text{CF}=\text{CF}-$ ,  $-\text{C}\equiv\text{C}-\text{HC}=\text{CH}-$ ,  $-\text{CH}=\text{CH}-\text{C}\equiv\text{C}-$ ,  $-\text{OCF}_2-$ , or  $-\text{CF}_2\text{O}-$ , and  $a$  indicates an integer of from 1 to 20;  $Z^4$  represents a single bond or  $\alpha,\omega$ -alkylene having from 1 to 4 carbon atoms, and when  $Z^4$

Application No.: 10/664,671

Docket No.: JCLA12230-R

represents  $\alpha,\omega$ -alkylene having 3 or 4 carbon atoms, ~~any the  $-\text{CH}_2-$  thereof the alkylene directly bonded with  $\text{A}^4$~~  may be substituted with  $-\text{O}-$ ,  $-\text{S}-$ ,  $-\text{COO}-$  or  $-\text{OCO}-$ ; m, n and q each independently indicates 0, 1 or 2, but  $m+n+q \geq 1$ ;

wherein when  $m+n+q=1$ , any  $-\text{CH}_2-$  of the alkyl represented by  $\text{R}^1$  is not substituted with  $-\text{CO}-$  and  $\text{Z}^4$  is a single bond; and

wherein when  $m+n+q=1$ ,  $\text{Z}^4$  is a single bond and  $\text{A}^4$  represents 1,4-phenylene,  $\text{Z}^1$ ,  $\text{Z}^2$  and  $\text{Z}^3$  each is not a single bond.

2. (original) A compound as claimed in claim 1, in which  $\text{R}^5$  in formula (1) is hydrogen.

3. (original) A compound as claimed in claim 2, in which  $\text{R}^2$  and  $\text{R}^3$  in formula (1) in claim 1 are hydrogen.

4. (original) A compound as claimed in claim 3, in which  $\text{A}^1$ ,  $\text{A}^2$ ,  $\text{A}^3$  and  $\text{A}^4$  in formula (1) in claim 1 are independently any of 1,4-cyclohexylene or 1,4-phenylene, and any hydrogen in these rings may be substituted with halogen.

5. (original) A compound as claimed in claim 3, in which  $\text{A}^1$ ,  $\text{A}^2$ ,  $\text{A}^3$  and  $\text{A}^4$  in formula (1) in claim 1 are independently any of 1,4-cyclohexylene or 1,4-phenylene, and any hydrogen in these rings may be substituted with halogen; and  $\text{Z}^1$ ,  $\text{Z}^2$  and  $\text{Z}^3$  are independently any of a single bond,  $-(\text{CH}_2)_a-$ ,  $-\text{O}(\text{CH}_2)_a-$ ,  $-(\text{CH}_2)_a\text{O}-$ ,  $-\text{O}(\text{CH}_2)_a\text{O}-$ ,

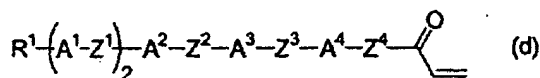
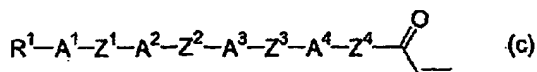
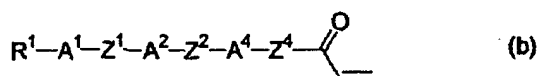
Application No.: 10/664,671

Docket No.: JCLA12230-R

—CH=CH—, —C≡C—, —COO—, —OCO—, —OCF<sub>2</sub>—, or —CF<sub>2</sub>O—.

6. (original) A compound as claimed in claim 5, in which Z<sup>4</sup> in formula (1) in claim 1 is a single bond.

7. (currently amended) Any one compound of formulae (a) to (d):



wherein R<sup>1</sup> represents hydrogen, halogen, —CN, —CF<sub>3</sub>, —CF<sub>2</sub>H, —CFH<sub>2</sub>, —OCF<sub>3</sub>, —OCF<sub>2</sub>H, —N=C=O, —N=C=S, or alkyl having from 1 to 20 carbon atoms, and any —CH<sub>2</sub>— of the alkyl may be substituted with —O—, —S—, —CO—, —COO—, —OCO—, —CH=CH—, —CF=CF— or —C≡C—, and any hydrogen thereof may be substituted with halogen or —CN; A<sup>1</sup>, A<sup>2</sup>, A<sup>3</sup> and A<sup>4</sup> each independently represent 1,4-cyclohexylene, 1,4-cyclohexenylene, 1,4-phenylene, naphthalene-2,6-diyl, tetrahydronaphthalene-2,6-diyl, fluorene-2,7-diyl, bicyclo[2.2.2]octane-1,4-diyl or bicyclo[3.1.0]hexane-3,6-diyl, and in these rings, any

Application No.: 10/664,671

Docket No.: JCLA12230-R

$-\text{CH}_2-$  may be substituted with  $-\text{O}-$ , and any  $-\text{CH}=\text{}$  may be substituted with  $-\text{N}=\text{}$ , and in these rings, any hydrogen may be substituted with halogen or alkyl having from 1 to 5 carbon atoms;  $Z^1$ ,  $Z^2$  and  $Z^3$  each independently represent a single bond,  $-(\text{CH}_2)_a-$ ,

$-\text{O}(\text{CH}_2)_a-$ ,  $-(\text{CH}_2)_a\text{O}-$ ,  $-\text{O}(\text{CH}_2)_a\text{O}-$ ,  $-\text{CH}=\text{CH}-$ ,  $-\text{C}\equiv\text{C}-$ ,  $-\text{COO}-$ ,  $-\text{OCO}-$ ,  $-(\text{CF}_2)_2-$ ,

$-\text{C}\equiv\text{C}-\text{COO}-$ ,  $-\text{OCO}-\text{C}\equiv\text{C}-$ ,  $-\text{CH}=\text{CH}-(\text{CH}_2)_2-$ ,  $-(\text{CH}_2)_2-\text{CH}=\text{CH}-$ ,  $-\text{CF}=\text{CF}-$ ,

$-\text{C}\equiv\text{C}-\text{HC}=\text{CH}-$ ,  $-\text{CH}=\text{CH}-\text{C}\equiv\text{C}-$ ,  $-\text{OCF}_2-$  or  $-\text{CF}_2\text{O}-$ , and  $a$  indicates an integer of from 1 to

20;  $Z^4$  represents a single bond or  $\alpha,\omega$ -alkylene having from 1 to 4 carbon atoms, and when  $Z^4$

represents  $\alpha,\omega$ -alkylene having 3 or 4 carbon atoms, any the  $-\text{CH}_2-$  thereof the alkylene directly

bonded with  $A^4$  may be substituted with  $-\text{O}-$ ,  $-\text{S}-$ ,  $-\text{COO}-$  or  $-\text{OCO}-$ , and

wherein in formula (a),

any  $-\text{CH}_2-$  of the alkyl represented by  $R^1$  is not substituted with  $-\text{CO}-$ ;

$Z^4$  is a single bond; and

$Z^1$  is not a single bond when  $A^4$  represents 1,4-phenylene.

8. (original) A compound as claimed in claim 7, in which  $R^1$  in formulae (a) to (d) is hydrogen, halogen,  $-\text{CN}$ ,  $-\text{CF}_3$ ,  $-\text{CF}_2\text{H}$ ,  $-\text{CFH}_2$ ,  $-\text{OCF}_3$ ,  $-\text{OCF}_2\text{H}$ , alkyl having from 1 to 10 carbon atoms, alkoxy having from 1 to 10 carbon atoms, alkoxyalkyl having from 2 to 10 carbon atoms, or alkenyl having from 2 to 10 carbon atoms;  $A^1$ ,  $A^2$ ,  $A^3$  and  $A^4$  are independently any of 1,4-cyclohexylene or 1,4-phenylene, and in these rings, any hydrogen may be substituted with halogen;  $Z^1$ ,  $Z^2$  and  $Z^3$  are independently any of a single bond,  $-(\text{CH}_2)_2-$ ,  $-(\text{CH}_2)_4-$ ,  $-\text{OCH}_2-$ ,  $-\text{O}(\text{CH}_2)_3-$ ,  $-\text{CH}_2\text{O}-$ ,  $-(\text{CH}_2)_3\text{O}-$ ,

Application No.: 10/664,671

Docket No.: JCLA12230-R

$-\text{O}(\text{CH}_2)_2\text{O}-$ ,  $-\text{CH}=\text{CH}-$ ,  $-\text{C}\equiv\text{C}-$ ,  $-\text{COO}-$ ,  $-\text{OCO}-$ ,  $-(\text{CF}_2)_2-$ ,  $-\text{CF}=\text{CF}-$ ,  $-\text{OCF}_2-$  or  $-\text{CF}_2\text{O}-$ ;  $Z^4$  is a single bond.

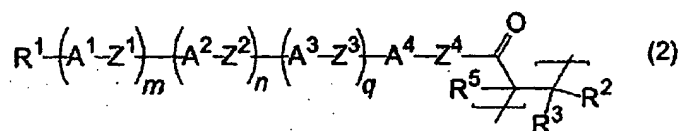
9. (previously presented) A liquid-crystal composition containing at least two polymerizable compounds, in which at least one polymerizable compound is the compound of claim 1.

10. (previously presented) A liquid-crystal composition, which contains at least two polymerizable compounds in which all the polymerizable compounds are the compounds of claim 1.

11. (previously presented) A liquid-crystal composition, which contains at least two polymerizable compounds that comprise at least one compound of claim 1 and at least one polymerizable compound except the compound.

12. (original) A liquid-crystal composition as claimed in claim 9, which additionally contains an optically-active compound.

13. (previously presented) A polymer having a constitutional unit of formula (2):



wherein  $\text{R}^1$  represents hydrogen, halogen,  $-\text{CN}$ ,  $-\text{CF}_3$ ,  $-\text{CF}_2\text{H}$ ,  $-\text{CFH}_2$ ,  $-\text{OCF}_3$ ,  $-\text{OCF}_2\text{H}$ ,

Application No.: 10/664,671

Docket No.: JCLA12230-R

-N=C=O, -N=C=S, or alkyl having from 1 to 20 carbon atoms, and any -CH<sub>2</sub>- of the alkyl may be substituted with -O-, -S-, -CO-, -COO-, -OCO-, -CH=CH-, -CF=CF- or -C≡C-, and any hydrogen thereof may be substituted with halogen or -CN; R<sup>2</sup>, R<sup>3</sup> and R<sup>5</sup> each independently represent hydrogen or an alkyl having from 1 to 3 carbon atoms; A<sup>1</sup>, A<sup>2</sup>, A<sup>3</sup> and A<sup>4</sup> each independently represent 1,4-cyclohexylene, 1,4-cyclohexenylene, 1,4-phenylene, naphthalene-2,6-diyl, tetrahydronaphthalene-2,6-diyl, fluorene-2,7-diyl, bicyclo[2.2.2]octane-1,4-diyl or bicyclo[3.1.0]hexane-3,6-diyl, and in these rings, any -CH<sub>2</sub>- may be substituted with -O-, and any -CH= may be substituted with -N=, and in these rings, any hydrogen may be substituted with halogen or alkyl having from 1 to 5 carbon atoms; Z<sup>1</sup>, Z<sup>2</sup> and Z<sup>3</sup> each independently represent a single bond, -(CH<sub>2</sub>)<sub>a</sub>-, -O(CH<sub>2</sub>)<sub>a</sub>-, -(CH<sub>2</sub>)<sub>a</sub>O-, -O(CH<sub>2</sub>)<sub>a</sub>O-, -CH=CH-, -C≡C-, -COO-, -OCO-, -(CF<sub>2</sub>)<sub>2</sub>-, -C≡C-COO-, -OCO-C≡C-, -CH=CH-(CH<sub>2</sub>)<sub>2</sub>-, -(CH<sub>2</sub>)<sub>2</sub>-CH=CH-, -CF=CF-, -C≡C-HC=CH-, -CH=CH-C≡C-, -OCF<sub>2</sub>-, or -CF<sub>2</sub>O-, and a indicates an integer of from 1 to 20; Z<sup>4</sup> represents a single bond or α,ω-alkylene having from 1 to 4 carbon atoms, and any -CH<sub>2</sub>- of the alkylene may be substituted with -O-, -S-, -COO- or -OCO-; and m, n and q each independently indicate 0, 1 or 2; and wherein when m+n+q=1, any -CH<sub>2</sub>- of the alkyl represented by R<sup>1</sup> is not substituted with -CO- and Z<sup>4</sup> is a single bond.

14. (original) A polymer as claimed in claim 13, in which R<sup>5</sup> in formula (2) is hydrogen.

Application No.: 10/664,671

Docket No.: JCLA12230-R

15. (original) A polymer as claimed in claim 13, in which  $R^2$ ,  $R^3$  and  $R^5$  are hydrogen.

16. (original) A polymer as claimed in claim 13, in which  $R^2$ ,  $R^3$  and  $R^5$  are hydrogen;  $A^1$ ,  $A^2$ ,  $A^3$  and  $A^4$  are independently any of 1,4-cyclohexylene or 1,4-phenylene, and any hydrogen in these rings may be substituted with halogen.

17. (original) A polymer as claimed in claim 13, in which  $R^2$ ,  $R^3$  and  $R^5$  are hydrogen;  $A^1$ ,  $A^2$ ,  $A^3$  and  $A^4$  are independently any of 1,4-cyclohexylene or 1,4-phenylene, and any hydrogen in these rings may be substituted with halogen; and  $Z^1$ ,  $Z^2$  and  $Z^3$  are independently any of a single bond,  $-(CH_2)_a-$ ,  $-O(CH_2)_a-$ ,  $-(CH_2)_aO-$ ,  $-O(CH_2)_aO-$ ,  $-CH=CH-$ ,  $-C\equiv C-$ ,  $-COO-$ ,  $-OCO-$ ,  $-OCF_2-$ , or  $-CF_2O-$ .

18. (original) A polymer as claimed in claim 13, in which  $R^2$ ,  $R^3$  and  $R^5$  are hydrogen;  $A^1$ ,  $A^2$ ,  $A^3$  and  $A^4$  are independently any of 1,4-cyclohexylene or 1,4-phenylene, and any hydrogen in these rings may be substituted with halogen;  $Z^1$ ,  $Z^2$  and  $Z^3$  are independently any of a single bond,  $-(CH_2)_a-$ ,  $-O(CH_2)_a-$ ,  $-(CH_2)_aO-$ ,  $-O(CH_2)_aO-$ ,  $-CH=CH-$ ,  $-C\equiv C-$ ,  $-COO-$ ,  $-OCO-$ ,  $-OCF_2-$ , or  $-CF_2O-$ , and  $Z^4$  is a single bond.

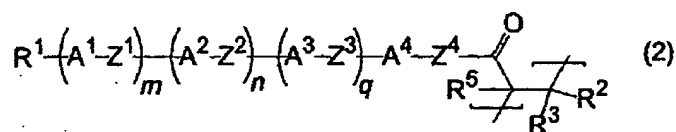
19. (original) A polymer as claimed in claim 13, in which  $R^1$  in formula (2) is hydrogen, halogen,  $-CN$ ,  $-CF_3$ ,  $-CF_2H$ ,  $-CFH_2$ ,  $-OCF_3$ ,  $-OCF_2H$ , alkyl having from 1 to 10 carbon atoms, alkoxy having from 1 to 10 carbon atoms, alkoxyalkyl having from 2 to 10 carbon atoms, or

Application No.: 10/664,671

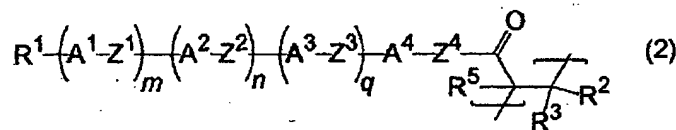
Docket No.: JCLA12230-R

alkenyl having from 2 to 10 carbon atoms;  $R^2$ ,  $R^3$  and  $R^5$  are hydrogen;  $A^1$ ,  $A^2$ ,  $A^3$  and  $A^4$  are independently any of 1,4-cyclohexylene or 1,4-phenylene, and in these rings, any hydrogen may be substituted with halogen;  $Z^1$ ,  $Z^2$  and  $Z^3$  are independently any of a single bond,  $-(CH_2)_2-$ ,  $-(CH_2)_4-$ ,  $-OCH_2-$ ,  $-O(CH_2)_3-$ ,  $-CH_2O-$ ,  $-(CH_2)_3O-$ ,  $-O(CH_2)_2O-$ ,  $-CH=CH-$ ,  $-C\equiv C-$ ,  $-COO-$ ,  $-OCO-$ ,  $-(CF_2)_2-$ ,  $-CF=CF-$ ,  $-OCF_2-$  or  $-CF_2O-$ ;  $Z^4$  is a single bond.

20. (previously presented) A polymer that is obtained through homopolymerization of one compound of claim 1 and has a constitutional unit of formula (2):



21. (previously presented) A polymer that is obtained from the liquid-crystal composition of claim 9 and has a constitutional unit of formula (2):



22. (previously presented) An optically-anisotropic material of the polymer of claim 13.



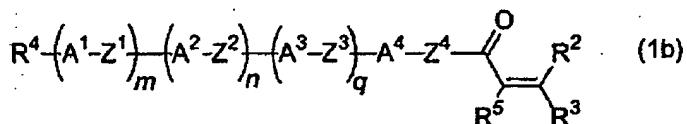
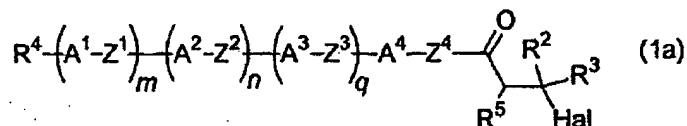
Application No.: 10/664,671

Docket No.: JCLA12230-R

23. (previously presented) A liquid-crystal display device, which contains the polymer of claim 13.

24. (original) A liquid-crystal display device, which contains the optically-anisotropic material of claim 22.

25. (original) A method for producing a vinyl ketone compound of formula (1b), which comprises reacting one molar equivalent of a compound of formula (1a) with from 1 to 10 molar equivalents of a Lewis acid at -70°C to 200°C, followed by dehydrohalogenating the resulting compound:



wherein  $R^4$  represents hydrogen, halogen, -OH, -CN, -CF<sub>3</sub>, -CF<sub>2</sub>H, -CFH<sub>2</sub>, -OCF<sub>3</sub>, -OCF<sub>2</sub>H, -N=C=O, -N=C=S, or alkyl having from 1 to 20 carbon atoms, and any -CH<sub>2</sub>- of the alkyl may be substituted with -O-, -S-, -CO-, -COO-, -OCO-, -CH=CH-, -CF=CF- or -C≡C-, and any hydrogen thereof may be substituted with halogen or -CN;  $R^2$ ,  $R^3$  and  $R^5$  each independently represent hydrogen or an alkyl having from 1 to 3 carbon atoms;  $A^1$ ,  $A^2$ ,  $A^3$  and  $A^4$  each independently represent 1,4-cyclohexylene, 1,4-cyclohexenylene, 1,4-phenylene, naphthalene-2,6-diyl, tetrahydronaphthalene-2,6-diyl, fluorene-2,7-diyl,

Application No.: 10/664,671

Docket No.: JCLA12230-R

bicyclo[2.2.2]octane-1,4-diyl or bicyclo[3.1.0]hexane-3,6-diyl, and in these rings, any  $-\text{CH}_2-$  may be substituted with  $-\text{O}-$ , and any  $-\text{CH}=\text{}$  may be substituted with  $-\text{N}=\text{}$ , and in these rings, any hydrogen may be substituted with halogen or alkyl having from 1 to 5 carbon atoms;  $Z^1$ ,  $Z^2$  and  $Z^3$  each independently represent a single bond,  $-(\text{CH}_2)_a-$ ,  $-\text{O}(\text{CH}_2)_a-$ ,  $-(\text{CH}_2)_a\text{O}-$ ,  $-\text{O}(\text{CH}_2)_a\text{O}-$ ,  $-\text{CH}=\text{CH}-$ ,  $-\text{C}\equiv\text{C}-$ ,  $-\text{COO}-$ ,  $-\text{OCO}-$ ,  $-(\text{CF}_2)_2-$ ,  $-\text{C}\equiv\text{C}-\text{COO}-$ ,  $-\text{OCO}-\text{C}\equiv\text{C}-$ ,  $-\text{CH}=\text{CH}-(\text{CH}_2)_2-$ ,  $-(\text{CH}_2)_2-\text{CH}=\text{CH}-$ ,  $-\text{CF}=\text{CF}-$ ,  $-\text{C}\equiv\text{C}-\text{HC}=\text{CH}-$ ,  $-\text{CH}=\text{CH}-\text{C}\equiv\text{C}-$ ,  $-\text{OCF}_2-$  or  $-\text{CF}_2\text{O}-$ , and  $a$  indicates an integer of from 1 to 20;  $Z^4$  represents a single bond or  $\alpha,\omega$ -alkylene having from 1 to 4 carbon atoms, and any  $-\text{CH}_2-$  of the alkylene may be substituted with  $-\text{O}-$ ,  $-\text{S}-$ ,  $-\text{COO}-$  or  $-\text{OCO}-$ ;  $m$ ,  $n$  and  $q$  each independently indicate 0, 1 or 2; Hal represents chlorine, bromine or iodine.